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TRANSPORTATION FACILITIES FOR DEVELOPING WOOD-USING INDUSTRIES IN NORTHEASTERN MINNESOTA

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should help the reader draw a conclusion as to the competitiveness and desirability of northeastern Minnesota in terms of the transportation resource.

Most of the information has been gathered from published material, through interviews with those concerned with the transportation industry, and from data supplied by them. The railroad, trucking, and shipping firms in the five-county area have been most helpful in supplying information. Railroads throughout the country furnished rate data, and grateful acknowledgment of their time and effort is hereby given. Particular acknowledgment is given to Mr. Donald Canning and John T. Hall of the Soo Line Railroad; Mr. Emil Novak, formerly with the Duluth, Missabe and Iron Range Railway; Mr. Robert H. Smith, formerly with the Duluth Chamber of Commerce; Mr. Robert Tomich and his staff at the Duluth Port Authority; Mr. Herman Isackson of Glendenning Motorways; and Mr. Jeff T. Peters of Norman G. Jenson, Inc. for their splendid cooperation and assistance.

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INTRODUCTION

Transporting raw materials to plant and finished products to market is an important function in any manufacturing program, and the costs involved are of prime consideration in plant expansion or new plant location. These costs, plus the transportation services offered by an area, largely determine its competitive situation with respect to other areas offering similar natural resources and production potential.

This report analyzes the transportation facilities in a five-county area of northeastern Minnesota proximate to Lake Superior: Cook, Lake, St. Louis, Carlton, and Pine Counties. The area is heavily forested, but both the timber and the labor resource are underused. Information is presented here on present patterns of wood raw material movement, the facilities available to shippers within the area, and representative transit times to selected market cities. Shipping rates and rate comparisons for wood products to these consumer markets are discussed only briefly, but additional information is available on request.

Because of the relatively high weight and low unit value of wood raw materials and the high weight-loss ratio of conversion, most primary forest product industries are raw-material oriented. Therefore, choices of location are somewhat restricted to areas of abundant timber, provided other factors of production within an area are not unreasonably deficient. Where the forest resource of an area is relatively homogeneous as to size, quality, species mix, and utilization potential, it may be expected that a fairly homogeneous forest industry with respect to raw material requirements will develop. And, because volume and frequency of shipments are important considerations in securing a competitive transportation rate structure, it would seem that an area with a sizable forest industry would have a more influential voice in molding a competitive shipping rate schedule.

Since the suppression of the wild fires that followed logging of the virgin timber, the regrowth of Minnesota's forests has been rapid. Recent forest inventories show that the harvest of timber in the five-county study area could be expanded considerably. This is particularly true for aspen for which the annual cut could be increased by about a half million cords.

Except for the cities adjacent to mining centers, the area north of Duluth is sparsely populated and heavily timbered, with farming a very minor land use. The area to the south of Duluth, comprising Carlton and Pine Counties, is more heavily farmed and has a better developed road network than is found in much of the north country. However, even here forests are by far the most common land use.

Duluth, at the extreme southeastern corner of St. Louis County, serves

Note: The author is an Associate Market Analyst on the staff of the Marketing Research Project of the Lake States Forest Experiment Station. His headquarters are at the Station's field office in Duluth, Minn. which is maintained in cooperation with the University of Minnesota Duluth.

as the transportation center for rail, truck, and marine shipping within the study area (figs. 1 and 2). A city of 110,000 people, it has long served as a concentration point for iron ore, grain, and, in the earlier days, lumber, which moved by way of the Great Lakes waterways. Its position at the western tip of Lake Superior, along with its excellent natural harbor, led to Duluth's emergence as a focal point for rail and highway development and as a gateway to the Northwest and Canada.

PRESENT PATTERNS OF RAW MATERIAL MOVEMENT

Present patterns of raw material movement for forest products harvested within the five-county study area are best summarized by the specific commodities produced.

Pulpwood

The bulk of the timber harvested within the five-county area is cut for pulpwood. In 1960, 502,000 (72 percent) of the 695,000 cords of timber products cut was pulpwood.^{1/} The major pulpwood outlets within the five-county area are at Cloquet (The Northwest Paper Co., Wood Conversion Co.) and Duluth (Superwood Corporation). Those located outside but frequently receiving wood from the study area are: Minnesota and Ontario Paper Co., International Falls; Blandin Paper Co., Grand Rapids; Hennepin Paper Co., Little Falls; St. Regis Paper Co., Sartell; and Waldorf Paper Products Co., St. Paul. In addition, considerable wood is shipped to several pulp mills in Wisconsin and Canada. Of the pulpwood harvested in the area in 1960, approximately 41 percent was utilized by local industries, 7 percent by other Minnesota mills, 47 percent by Wisconsin mills, and 5 percent by mills in other areas.^{2/}

In 1963, 486,000 cords of pulpwood were produced in the area; of this, 63 percent was utilized in Minnesota and 37 percent shipped to Wisconsin.^{3/} The percent of pulpwood exported to Wisconsin has declined steadily for the past several years, although the total volume shipped there increased slightly in 1963 (table 1). Much of this export volume is produced in northern St. Louis, Lake, and Cook Counties. One major reason for the decline is the changes in pulping technique, which allow dense hardwoods and more aspen

^{1/} Basic Work Tables - Timbercut, Minn., 1960. (Unpublished report on file at the Lake States Forest Experiment Station.)

^{2/} A. G. Horn. Pulpwood production in Lake States Counties, 1960. U.S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 94, 28 pp., illus. 1962.

^{3/} Data on file at the Lake States Forest Experiment Station.

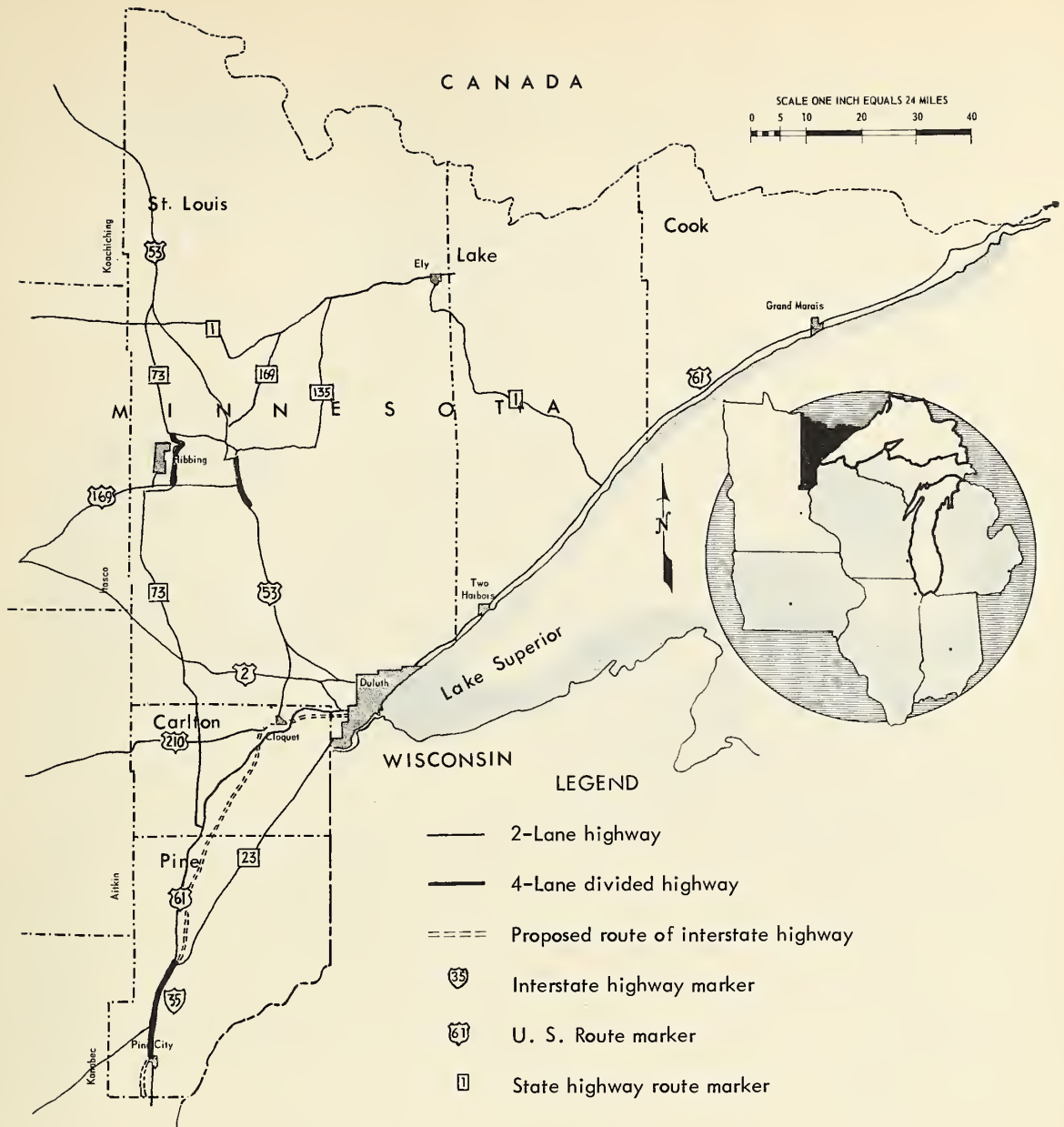


Figure 1.--The study area, showing U.S. trunk line and major state highways

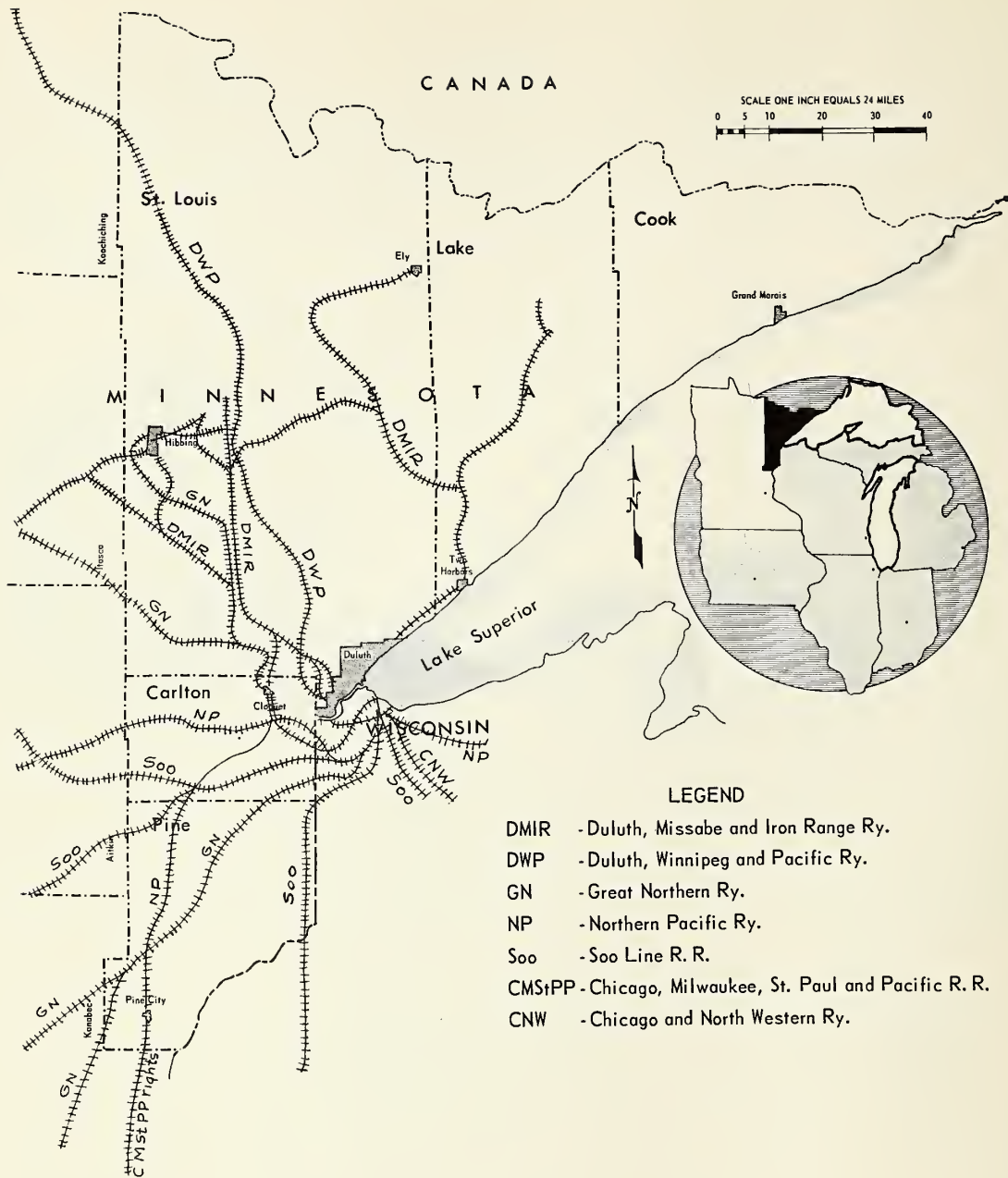


Figure 2.--Common carrier railroads serving the five-county area

to be utilized in place of spruce and balsam fir. These substitute materials are plentiful in Wisconsin. In addition, the shipment of round wood and chips from Western States has increased during this period.

Table 1.--Pulpwood production and shipments,
northeastern Minnesota, 1952-1963^{1/}

(Thousand cords)

Year	Total cut	Destination					
		Minnesota		Wisconsin		Other	
	Cords	Cords	Percent	Cords	Percent	Cords	Percent
1952	375	(2/)	-	(2/)	-	(2/)	-
1959	392	(2/)	-	(2/)	-	(2/)	-
1960	502	242	48	236	47	24	5
1961	461	257	56	192	42	12	2
1962	458	280	61	174	38	4	1
1963	486	305	63	181	37	0	0

^{1/} Includes Lake, Cook, St. Louis, Carlton, and Pine Counties.

^{2/} Data not available.

The mode of transportation for pulpwood harvested within the area varies from all or nearly all by truck, to rail and truck, to primarily rail (fig. 3). However, wood shipped by rail is usually trucked to the railhead for reloading onto cars; this trucking distance varies from a few miles to 30 or more. The exception is an operation which trucks pulpwood to lakeside boom areas in Grand Marais, Hovland, and Sugar Loaf Cove, then rafts it across Lake Superior to Ashland, Wis., and finally carries it by rail to the pulp mills. A small amount is also shipped via Lake Superior to Green Bay, Wis. The amount of pulpwood exported from Minnesota's Lake Superior ports between 1955 and 1962 varied from 47 thousand to 61 thousand cords annually.

Mills capable of utilizing small-sized aspen depend considerably on small-operator and so-called farmer-produced wood. Small aspen is readily available relatively close to the woodyards (usually 30 to 35 miles), making truck wood a more economical source of supply. The larger mills, which require larger volumes and a variety of species, must extend their procurement areas somewhat, thereby making railed wood more competitive with trucked wood.

Based on a 1-percent waybill sample, which included 131 carloads, the



Figure 3.--Pulpwood comprises over 70 percent of the total volume of timber harvested in the five-county area. Much of this pulpwood is railed from northern St. Louis and Lake Counties to mills in Minnesota and Wisconsin.

average short-line hauling distance for Minnesota's intrastate pulpwood railroad movements for the years 1958 to 1961 was 199 miles with little deviation from the average for any particular year.^{4/}

Veneer Logs

There are no veneer plants in the area at this time. The Ameriply

^{4/} Interstate Commerce Commission. State to State distribution, products of the forest, one percent waybill sample. 1958-1961 Annual Reports. Washington, D.C.

Corporation of Grand Marais produced aspen and birch veneer from 1961 until 1964, when the mill burned. Log deliveries were entirely by truck, and procurement was largely within 30 to 35 miles of the plant, but included intermittent Canadian imports.

In 1960, 1,816,000 board feet of veneer logs were cut in the area. Of this, 1,200,000 was white and yellow birch, 436,000 was aspen, and 110,000 was elm, with minor amounts of basswood, maple, and ash accounting for the balance. The bulk of the veneer logs is harvested in the northern areas and trucked to Wisconsin mills. The remainder goes to Minnesota and Michigan.

Specialty Bolts

The largest user of specialty bolts cut in the area is Diamond National Corporation of Cloquet. They utilize birch, aspen, and basswood, with deliveries to the mill by both truck and rail. Because of exacting manufacturing requirements, their raw materials must be of a much higher quality than the ordinary bolts acceptable for pulpwood.

In addition to the above use, minor amounts of bolt wood are used by various other smaller specialty plants.

Saw Logs

Saw logs harvested in the area generally go to local mills. While portable milling is still practiced, most of the larger mills are stationary, with logs trucked in from distances up to 50 miles. Species and quality determine the feasibility of longer hauls, and occasionally quality white and red pine logs are shipped greater distances. Hauling is entirely by truck, and tandem-axle and tractor-trailer rigs are commonly used by the larger operators.

Lumber

The bulk of the lumber produced within the five counties is marketed regionally, with Minneapolis-St. Paul and the intervening area providing the principal outlets. Private and contract truckers haul nearly the entire amount; the remainder moves by rail. Some lumber is shipped to the neighboring States of Wisconsin and Iowa, as well as Michigan, Ohio, Indiana, Illinois, Kansas, and Missouri. Occasionally loads are shipped to more distant locations, particularly high-grade white pine and hardwood specialty items. The interstate shipments are made by both rail and truck.

A considerable amount of the lumber produced in the area is consumed there. The small quantities produced by the many portable mills, which usually operate intermittently (some only a few weeks a year), become significant in volume simply because these mills are so numerous. Most of

their production is sold in a strictly local market and quite often is sawn on a custom basis. What does enter the regional market usually does so through lumber wholesalers.

Posts, Poles, and Piling

While there are no wood-treating facilities within the area, it is estimated that in 1960, 388,000 posts, 48,000 poles, and 76,000 lineal feet of piling were produced there. A subsidiary of the Penta Wood Products Corporation of Siren, Wis., is located in Buyck in the northwestern corner of St. Louis County. Jack pine posts and poles are supplied to the plant from the immediate area. They are then sorted into length classes, rossed, trimmed, bundled, and partially air dried before being trucked to the treating plant. Pole harvesting operations are scattered throughout the northern area, with most of their shipments going to treating plants at Cass Lake, Minn., and Siren, Wis.

Woodpulp

Woodpulp movements are difficult to determine. Substantial yearly imports of Canadian or Scandinavian pulp are made through the port of Duluth, and there are relatively large rail movements into the State from Western origins. While some of this imported pulp is utilized in the area, the total amount processed there is not known. Neither is the amount of woodpulp produced in the area and shipped out for processing elsewhere.

Other Products

Small amounts of cedar fencing, mine lagging, cabin logs, and lath are also produced in the area, but are of relatively minor importance.

Chips

Chipped sawmill and other wood residues have become important sources of raw material for pulp mills in the South and West where large concentrations of softwood waste are available. In the Northeast, central chipping plants bring together the residues of many small sawmills that could not afford to install a chipper of their own. In the Lake States at least five pulp mills have begun purchase-chip programs; but within the five-county study area none have done so as yet, nor have any chipping plants been installed there. The bulk of the chips now used by Lake States mills comes from western sources.

Chips have the flow characteristics required to satisfy more automated handling systems. According to reports, cost savings in the pulp mill yard in handling chips as opposed to roundwood are substantial. Nevertheless, since most handling systems in the Lake States are designed to accommodate

the 8-foot pulp stick, as are other forwarding components, it is often difficult and costly to make a change. Several problems have to be worked out before deciding to convert to a chip system. For example, expensive storage and transfer facilities need to be installed in the mill yard. The freezing of chips could hinder unloading or subsequent transfer operations. Contamination of the chip pile could be particularly important to those making high-quality papers.

Outside chip storage may be the first stage of conversion, with some chipping done at the mill. At the same time remote chipping installations utilizing residues or roundwood could develop as the economics of the situation would allow. Certainly a long-term contract or guaranteed market would be essential before the heavy investment in a debarker and chipper could be made.

Although several roundwood chipping plants have been established in the South, the economics of the remote chipping of roundwood in the Lake States either at a central chipping plant or roadside with a portable chipper are still largely unknown. However, nationally, pulpwood procurement techniques are in a dynamic state. Entire systems based on radical departures from traditional methods are being developed; some of these require substantial investment in equipment. Within the study area there seems to have been a tendency to follow more set patterns, partly because remote chipping has not become established and partly because the systems of procurement have stressed the small independent contractor, many of which lack the capital or the guaranteed market on which to base substantial investment and expansion.

Many southern railroads have built special cars capable of handling upwards of 5,000 cubic feet of chips, although much hauling is still done in converted coal or rack cars. In the North, the probability is that boxcars would be used for part of the year at least, along with high-sided gondolas or hopper cars, redesigned for chip service. Iron ore hopper cars would be far too small for desirable service. There are still many questions to be answered concerning the potential of remote chipping in the Lake States--economics, equipment design, ultimate chip demand, etc. However, it does offer certain advantages, and in the future could be an important factor in the pattern of wood procurement in the Lake States.

TRANSPORTATION FACILITIES

Transportation development has often been a function of natural resource utilization. In northeastern Minnesota, early railroad construction was tied directly to timber harvesting and iron mining, for which it was well suited. The lines developed in the study area to facilitate ore shipments have been long-lived, since mining has been concentrated in a few locations and the volume of ore was not soon depleted. However, lines developed primarily for logging and lumbering were often temporary--used only long enough to harvest the mature timber, then abandoned or taken up to be used in another location. Nevertheless, while some of the area once

served by rail lines no longer has these facilities, and in spite of the relatively low population density, the lack of manufacturing centers, and the isolation created by the lightly inhabited adjacent areas, the existing railroad system is exceptionally good.

Transportation centers have often emerged at the juncture of water and land transportation facilities. The study area has such a center in Duluth, which is the western end of the recently expanded Great Lakes-St. Lawrence Seaway System. Duluth early developed as a major rail-port center through which products moved to Midwest, Eastern, and, by trans-shipment, foreign markets.

Likewise, as the motor truck became an efficient competitor for over-land transportation, Duluth became a juncture point for trunk highways. However, as highway transportation developed after the virgin timber had been cut, and since farming never became a major land use, secondary road systems were not constructed to the degree they might have been, particularly in the northern portion of the area. This, perhaps, is the area's weakest aspect in transportation facilities, although considerable harvesting of forest products is done during the winter season through the use of temporary woods roads, constructed to minimum standards and relying on frozen soil conditions for load-bearing properties.

Railroads

Lines

There are seven Class I, line haul, common carrier railroads^{5/} with facilities in the five-county area (fig. 1). Figure 4 shows the prime line hauling territory, the main routes, and the principal cities served by these railroads.

Cook County has no common carrier railroads. Part of Lake County is served by the Wales Branch of the Duluth, Missabe and Iron Range Railway. St. Louis County is served by the Duluth, Missabe and Iron Range, the Duluth, Winnipeg and Pacific, and the Great Northern lines. Carlton and Pine Counties have facilities of the Northern Pacific, Soo Line, and Great Northern roads.

Duluth is an eastern terminus of the Great Northern and Northern Pacific roads and a northern terminus for the Chicago and North Western and the Milwaukee roads. In addition, the Soo Line maintains a central yard there; and two roads whose entire lines are within the northern study area

^{5/} Class I railroads are those having annual operating revenues of \$3,000,000 or more.

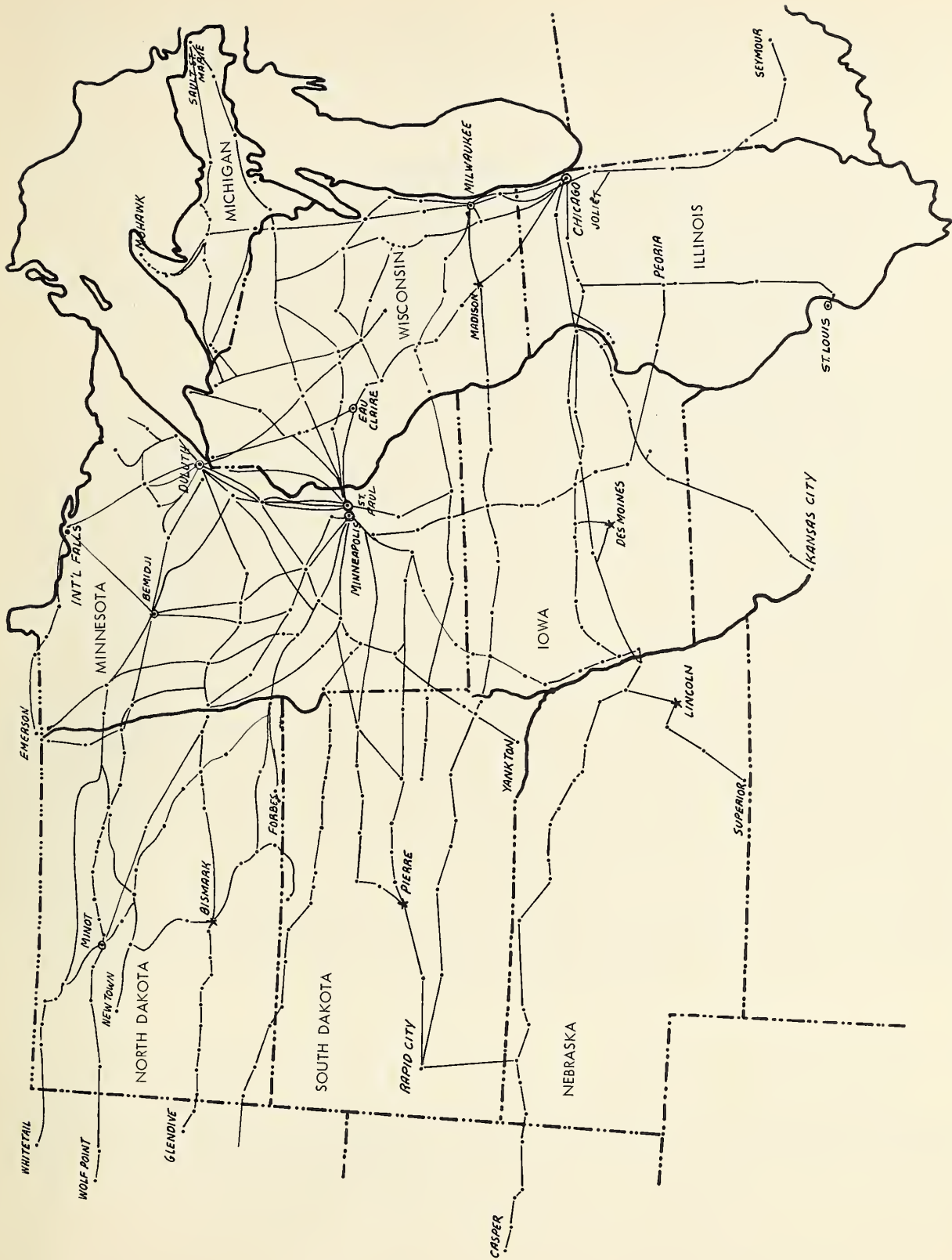


Figure 4.--Prime line hauling territory of local railroads (Lines extend to west coast)

also terminate in Duluth: the Duluth, Winnipeg and Pacific has its southern terminal there, and it is the home office as well as the site of the principal connecting terminals of the Duluth, Missabe and Iron Range Railway.

Railroad Service and Transit Times

Information on representative transit times to midwestern market locations is limited. None of the local lines has trains terminating in midwestern centers other than Chicago, St. Louis, Omaha, and Kansas City, and it is difficult to obtain this information from connecting lines. The times shown in fig. 5 are somewhat arbitrary but are indicative of what can be expected under reasonably good conditions.

Fifteen freight trains are scheduled to leave Duluth each day--two to the north for Canadian connections, three to the east for Sault Ste. Marie or Chicago, five south to the Twin Cities for connections east, south, and west, and five to the west for main line connections to the Far West. Many of these trains leave Duluth between midnight and 2 a.m.; thus, they may arrive at a destination, such as Chicago, the next night, taking approximately 24 hours for the trip. However, for customer delivery, the time would essentially be two days. Because these trains do not leave Duluth until late in the day, outlying towns in the study area have time to make connections and enjoy delivery times similar to those of Duluth firms. Figure 5 schematically exhibits a generalized time-of-arrival schedule for Duluth freight.

Traffic originating in Duluth has one-line hauls to such destinations as Chicago, Rockford, Peoria, and Rock Island, Ill.; Terre Haute, Ind.; St. Louis and Kansas City, Mo.; Omaha and Lincoln, Nebr.; Des Moines and Council Bluffs, Iowa; and Casper, Wyo. In addition, one-line hauls are available to nearly every city in Wisconsin, North and South Dakota, Montana, Washington, and northern Idaho and Oregon. The area does not have direct one-line hauls to many large midwestern market centers. Actually, no area in the country can offer one-line hauls to any large number of midwestern market centers. With the connecting facilities available in the Twin Cities, Illinois, and Iowa, favorable two-line hauls from the area are possible to a large midcontinent area.

Trailer-on-Flat-Car Service

Trailer-on-flat-car service is available under several plans on all lines serving the area. Presently, ramps are located at Duluth, Cloquet, Hibbing, and Virginia; but while the volume of this service has been

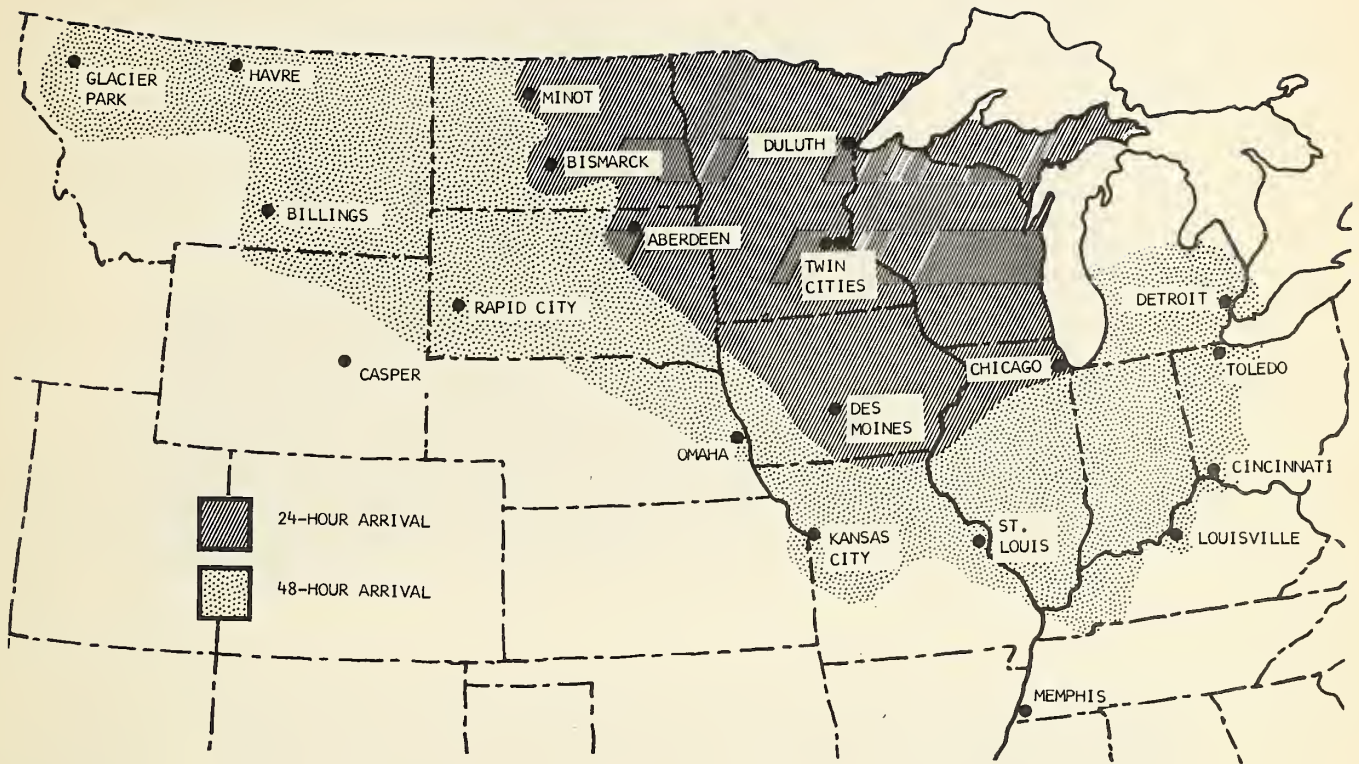


Figure 5.--Generalized transit time map for freight from Duluth, Minn.

expanding rapidly for many of the local lines, it has had limited use in the forest products field. One exception is paper products, where significant volumes are now shipped by this method.

Less-Than-Carload Service,
Reciprocal Switching, In-Transit Service

Less-than-carload service is available to most of the towns in the area, and reciprocal switching is available in the Duluth area where many large concerns take advantage of this service. Standard in-transit privileges are also offered on various forest products.

Pulpwood Facilities

Large quantities of pulpwood are shipped by rail from the area, and many loading ramps have been built to aid in transferring the wood from truck to rail car (figs. 6 and 7). These have become less important since the truck-mounted hydraulic loader has been widely adopted by area producers.

In 1947 the D.M. & I.R. railroad extended the Wales branch primarily to haul pulpwood from the heavily timbered area of Lake County. Although this branch, terminating at a pulpwood yard at Forest Center in the Superior National Forest, has extensive pulpwood yards at Sawbill Landing, Kelly, and Isabella, its potential has not been fully exploited.

Mergers

Several of the railroads have plans for mergers. One that is moving closer to a decision is the application to merge the Great Northern; Northern Pacific; Chicago, Burlington and Quincy; and the Spokane, Seattle and Portland roads. The latter two roads are presently wholly owned in



Fig. 6.--Ramps are available at many sidings to facilitate the loading of pulpwood onto rail cars. (Photo courtesy of Soo Line Railroad Co.)

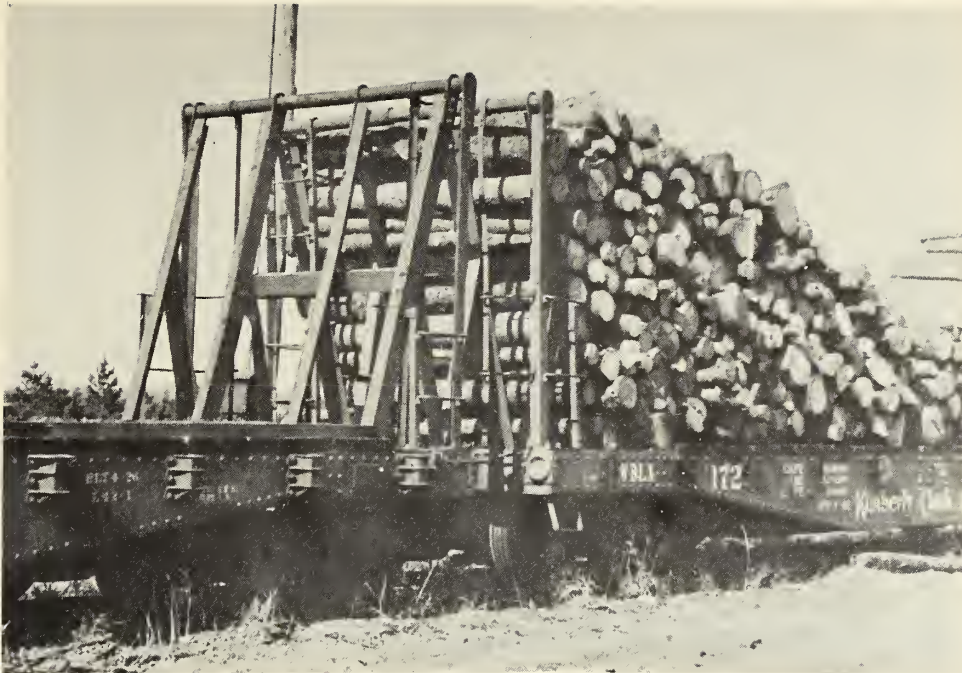


Fig. 7.--Some special large-capacity pulpwood cars are used, but most pulpwood is shipped in gondola or smaller end rack cars. (Photo courtesy of Soo Line Railroad Co.)

equal parts by the first two. This merger would offer the area many additional shipping points, with a one-line haul into Chicago and other market centers.

Trucking

Interstate Lines

There are six interstate, regular-route truck common carriers with terminal facilities in Duluth, and two irregular-route common carriers with rights to haul building materials in Minnesota, North and South Dakota, Nebraska, Iowa, Illinois, Indiana, Ohio, Pennsylvania, Michigan, and Wisconsin. The regular-route carriers offer daily direct service to such market centers as Chicago, Cleveland, Detroit, Toledo, St. Louis, Kansas City, Des Moines, Sioux City, Omaha, and Denver (fig. 8).

Most lines operating in the area offer several truck types including flat beds. In addition, through connecting carriers, direct service is

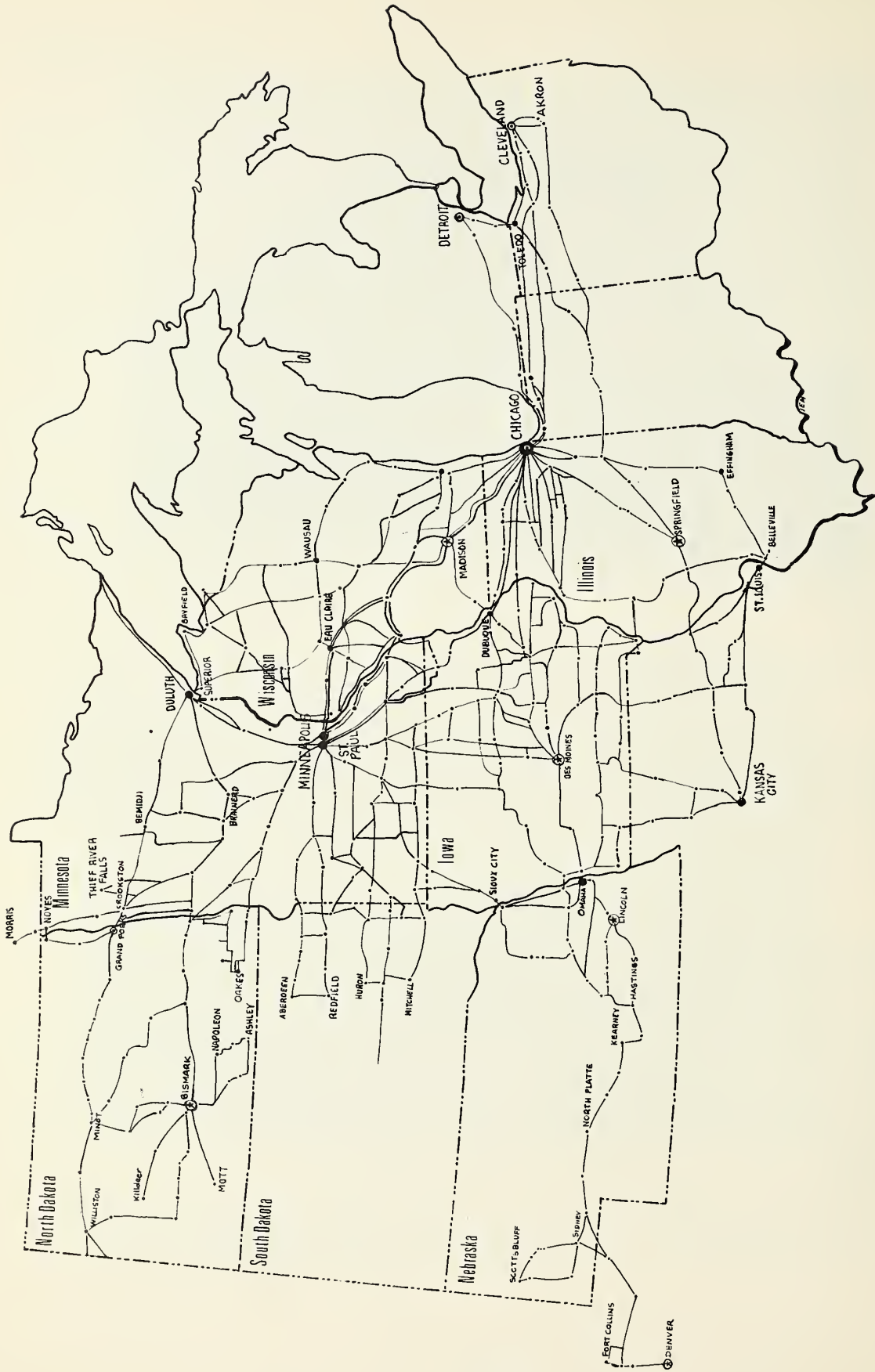


Figure 8.--Prime line hauling territory for interstate regular-route truck lines.

offered to most midwestern market centers on truck-load quantities without the necessity of transferring cargo.

Feeder Lines

The bulk of the area is served by various feeder-type, common carrier, truck lines. They offer daily direct service to all major cities and towns in the study area. In addition, the motor line which serves the majority of these outlying points connects in the Twin Cities with many major trans-continental carriers, so that two-line hauls are available from these points to many market centers.

Highways

The study area is served by both U.S. interstate trunk routes and the proposed national interstate super highway system. U.S. routes 2, 53, and 61 intersect in Duluth. U.S. 2 runs from Seattle, Wash., to Bangor, Maine; U.S. 53 from International Falls, Minn., through St. Louis County to southwestern Wisconsin; and U.S. 61 from Grand Portage, Minn., through portions of Cook, St. Louis, Carlton, and Pine Counties, eventually terminating in New Orleans, La. U.S. Trunk Highway 169 begins in Virginia, Minn., and runs through the Twin Cities, south-central Minnesota, central Iowa (Fort Dodge), Missouri (St. Joseph, Kansas City), and Kansas, terminating south of Tulsa, Okla.

The area will be connected to the national super highway system (fig. 9) by Interstate Highway 35, a portion of which has been completed between Duluth and the Twin Cities. Eventually, this road will run from Duluth to Laredo, Texas, via Des Moines, Kansas City, Wichita, Oklahoma City, Ft. Worth, and San Antonio. The connections most important to the study area are with Interstate Highways 94 and 90. These are major east-west routes through the Twin Cities and southern Minnesota; the greater portion of the highway from Minneapolis-St. Paul to Chicago is already completed.

Present highways give this area excellent connections and allow fast and efficient delivery schedules to much of the Midwest. Furthermore, the territory between northeastern Minnesota and most midwestern market centers has relatively flat to rolling topography, allowing maximum hauling efficiency. Table 2 shows mileages to the larger cities in the United States.

Water Transportation

St. Lawrence Seaway

Duluth is the westernmost port on the Great Lakes-St. Lawrence Seaway System. This waterway was substantially expanded and opened to deep-draft, ocean-going vessels in 1959. Previously traffic consisted almost entirely



LEGEND

- Interstate and other limited access expressways completed
- Interstate expressways planned

Fig. 9.--Map of national super highway system--
midwest area

of shipments between ports on the Great Lakes--mainly iron ore, coal, and grain utilizing "lakers" (relatively small cargo ships, and special ore- and coal-carrying vessels). A minor amount of grain was exported to overseas markets by transferring from "lakers" to "canallers" for the trip through the Welland Canal to Montreal where it was transferred to ocean-going ships. The expanded seaway has a critical depth of 27 feet although parts are designed for deeper drafts.

For the port of Duluth-Superior, tonnages of all general cargo items have increased steadily for both import and export cargo since 1959. In 1963 imports rose substantially and export tonnage doubled over the previous

Table 2.--Highway distances from Duluth
to selected major cities^{1/}

Destination	Miles	Destination	Miles	Destination	Miles
Atlanta, Ga.	1,174	Des Moines, Ia.	402	Philadelphia, Pa.	1,241
Baltimore, Md.	1,173	Detroit, Mich.	717	Pierre, S. D.	504
Birmingham, Ala.	1,137	Indianapolis, Ind.	667	Pittsburgh, Pa.	940
Bismarck, N. D.	448	Jackson, Miss.	1,182	St. Louis, Mo.	675
Boston, Mass.	1,453	Kansas City, Mo.	609	Seattle, Wash.	1,689
Buffalo, N. Y.	1,008	Louisville, Ky.	778	Spokane, Wash.	1,401
Chicago, Ill.	480	Milwaukee, Wis.	405	Springfield, Ill.	597
Cleveland, Ohio	822	Mpls.-St. Paul	150	Toledo, Ohio	720
Columbus, Ohio	840	Nashville, Tenn.	935	Topeka, Kansas	670
Dallas, Texas	1,102	New York	1,322	Tulsa, Okla.	866
Denver, Colo.	999	Omaha, Nebr.	515	Wichita, Kansas	804

^{1/} Limited access highways have been utilized where most practical even though not the absolute shortest route.

Source: Rand McNally Road Atlas.

year. These trends, coupled with an encouraging increase in regularly scheduled sailings, indicate a bright outlook for general cargo shipping through the port.^{6/}

Harbors

Duluth has the only deep water harbor in the five-county area with facilities for handling general cargo traffic (fig. 10). Other deep water harbors include Two Harbors, Taconite Harbor, and Silver Bay; however, at present iron ore or ore concentrates and coal are the only commodities of any consequence shipped through these three ports, and general cargo facilities are undeveloped. (Ore shipping through the Two Harbors facility was terminated after the 1962 shipping season.)

^{6/} Trends in direct shipments to and from overseas markets for wood and paper products from Lake States ports have been reported in U.S. Forest Service Research Note LS-4 obtainable at the Lake States Forest Experiment Station.



Figure 10.--Duluth has excellent harbor facilities. The natural break-water affords protection to the Clure Public Marine Terminal and inner harbor. The large open storage area toward the top is backed up by the tank farm and terminal buildings.

Duluth, protected by a natural breakwater, provides excellent harbor facilities. Water depth runs from 32 feet in the approaches to 27 feet in the harbor basin, the Public Marine Terminal, and the grain and ore docks. The depth decreases to 23 feet in the remaining channels and to 20 feet in the upper reaches into the St. Louis River. Present plans call for extending the 27-foot depth to more slips, and expanding the 23-foot depth to service a greater area.

Facilities have been steadily improved for the handling of general cargo freight at the public and private terminals since the seaway expansion (fig. 11).

Ancillary Services

Duluth has four foreign-freight forwarders who deal extensively with general cargo imports and exports--Lake Superior Shipping, Inc.; Norman G. Jensen, Inc.; R. E. A. Express; and the Svensson Shipping Agency, Inc. The



Figure 11.--Duluth's Public Marine Terminal is a modern, efficient and uncongested general cargo facility. Here ship's tackle is being used to unload one vessel while the rail mounted, 90-ton gantry cranes are working on another vessel.

last three are also custom house brokers. Additional foreign freight forwarders and custom house brokers are available in Minneapolis and St. Paul. In addition to these services, eighteen steamship companies have vessel agents in Duluth.

The larger Duluth banks have long been active in supplying necessary services to customers involved in international trade, and often initiate the task of establishing credit risk, obtaining or establishing letters of credit, and performing other functions attendant to foreign trading. The Finnish government has the only consular office in Duluth.^{7/} Duluth is a custom port of entry, and the U.S. Government maintains full custom service. There is no foreign trade zone in the area nor are export packing companies available.

Potential for Interlake Shipping

Prior to World War II, package freight shipments between Great Lakes ports amounted to a considerable volume, often in excess of a million tons a year for the port of Duluth. A major portion of this cargo such as lumber could be classed in the semi-bulk category, but other wood and paper products of a general cargo nature were included. This interlake service was discontinued during the war. An attempt to restore service was made late in the shipping season of 1959 when two ore carriers were outfitted to carry up to 60 demountable trailer-truck containers on their decks. Though the service was enthusiastically welcomed by a few industries, cargoes did not develop as expected and the service was discontinued. It seems doubtful that interlake shipping of general cargo freight will be an important transportation medium in the near future. It is significant however, that some shippers who took advantage of the service in 1959 reported savings of up to 25 percent over land transportation costs. Rates averaged about 15 percent below rail charges between similar destinations, but there were wide variations between commodities and volumes.

Hope is raised from time to time for revival of package freight service on the Great Lakes. Recently a proposal was made to institute service between Duluth and Buffalo, using special freighters with ice-breaking capabilities to allow operation 10 months out of the year.

Freight Forwarders

In addition to the four freight forwarders who are largely concerned with seaway freight movement, four companies in Duluth handle general freight on a national and international basis: Acme Fast Freight Company, National Carloading Corporation, United Freight Forwarders, Inc., and Universal Carloading and Distributing Company. These forwarders offer a variety of transportation services to area shippers, including pickup and delivery through contract truckers, mixed car loading, scheduling, customs and export papers, plus many other functions attendant to freight and cargo transfer.

^{7/} Consular offices are maintained in Minneapolis by the British, Colombian, Danish, Finnish, Norwegian, and Swedish governments.

TRANSPORTATION COST ANALYSIS

Rates on Raw Material Movement

Trucking Rates

Trucking rates for pulpwood vary by distance, road conditions, species, and skill of the trucker in negotiating a contract. These rates are usually determined within the framework of an overall delivered price to plant or f.o.b. rail car. That is, the procuring company has one delivered rate at which they purchase wood; and trucking charges, as a component of this total cost, may vary within a relatively narrow range based on the actual hauling conditions for a particular logging chance.

There seems to be no formal organization of the various private or contract haulers within the study area. Apparently the trend has been towards the development of the contract trucker as a specialized independent component of the logging process, although many logging contractors in the area also operate their own trucks. A hydraulic loading device added to each truck gives it independence of operation from the other wood-forwarding components. This permits separating the highway trucking function from the general logging contractor's responsibility.

Rates have not been standardized nor have rate schedules been developed. Each trucker and job is dealt with separately, with rates based on past experience from nearby or similar locations.

In the northern portion of the study area, pulpwood is generally trucked to rail loading points from distances up to 30 miles, with the average haul approximately 12 to 15 miles. The range of hauling rates is reported to be \$2.50 to \$6.00 per cord; the average is estimated at \$3.75 to \$4.00. This includes the cost of transfer from truck to car and wiring of the cars when necessary. On some occasions, wood going to Wisconsin mills has been hauled 100 miles or more to rail heads just over the State line to take advantage of lower intrastate one-line rail-hauls. In the southern part of the area, where most of the pulpwood cut is trucked directly to the mills, average trucking distance is somewhat longer; hauls range up to 50 or 60 miles.

The practice of paying rail-truck differentials for pulpwood is apparently not as well developed in this area as in lower Michigan.^{8/} One report

^{8/} James, Lee M., and Lewis, Gordon D. Transportation costs to pulpwood shippers in Lower Michigan. Mich. Agr. Expt. Sta. Quart. Bul. 42(3): 28 pp., illus. 1960.

showed an additional \$1.25 per cord paid for direct truck-delivered wood over f.o.b. car prices for an approximate 50-mile haul; another showed a \$3.00 differential for boltwood for a similar length haul.

Rail Rates

The only primary forest product currently transported by rail within and from the area in any appreciable volume is pulpwood. Small amounts of poles and lumber are exported and these take the regular lumber rates (table 3). These rates also cover wooden pickets and related wooden items. Pulpwood tariffs have been developed by the Soo Line, Northern Pacific, D.W. & P., Great Northern, and the D.M. & I.R. to cover the relatively heavy movement from origins in Minnesota to the various pulp mills in Wisconsin. A very small amount of pulpwood moves by rail from origins on the Soo, Great Northern, and Northern Pacific lines in Carlton and Pine Counties; the largest rail movements from within the area originate in northern Lake and St. Louis Counties. Representative intrastate rates are shown in table 4 and interstate rates in table 5.

Some area railroads have developed per-cord pulpwood rates in contrast to the common per-hundred-pound rates. This is a relatively new pricing method, and is often associated with multiple-car movements. That is, a special rate is allowed when 10 or more cars are shipped from one origin to one destination on one bill of lading. While a substantial saving is possible to the shipper, the use of multiple-car rates is limited to the larger operators who can schedule the loading of a large number of cars within a 48-hour period. That these rates have been developed does indicate, however, that the local carriers have an interest in creating lower transportation costs when efficiency can be improved, for it must be realized that pulpwood rates are among the lowest commodity rates in the country.

Rates on Finished Product Movement

Shipping rates for several forest products were obtained but, because of the space required to properly present the material, they are not included with this report. They are available on request. (See list at the end of this report for additional material available.)

The general commodity classification system used by motor carrier rate bureaus is patterned after that of the railroads, and their rates are naturally sensitive to comparable rail rates. For simplification, most of the rate information and rate comparisons deal with rail and ship rates.

Rail Rate Structure

Before discussing rate comparisons it is important to consider briefly the ratemaking structure of the railroads, and to understand its influence

Table 3.--Rail rates^{1/} for lumber, poles, fence material and related products
(Cents per 100 pounds)

Destination	Minimum weights (in thousand pounds) from -									
	Superior, Wis.				Keewatin Minn.		Orr, Minn.		Ely Minn.	
	30	34	50	60	34	50	34	50	50	
Chicago	45 $\frac{1}{2}$	-	43	39	57 $\frac{1}{2}$	46 $\frac{1}{2}$	59 $\frac{1}{2}$	-	-	49 $\frac{1}{2}$
Cleveland	-	79	-	70	90	-	-	-	-	-
Des Moines	51 $\frac{1}{2}$	-	41 $\frac{1}{2}$	-	54 $\frac{1}{2}$	43 $\frac{1}{2}$	-	-	-	-
Detroit	-	74	-	56 $\frac{1}{2}$	88	-	-	-	-	-
Indianapolis	-	70	-	57 $\frac{1}{2}$	84	-	-	-	-	-
Kansas City	65 $\frac{1}{2}$	-	52 $\frac{1}{2}$	-	72	57 $\frac{1}{2}$	-	-	-	-
Louisville	-	83	-	70	93	-	93	-	-	-
Milwaukee	44 $\frac{1}{2}$	-	37	33	53 $\frac{1}{2}$	42 $\frac{1}{2}$	-	-	-	-
Omaha	56 $\frac{1}{2}$	-	45 $\frac{1}{2}$	-	59 $\frac{1}{2}$	47 $\frac{1}{2}$	90	-	-	-
Pittsburg	-	85	-	80	99	-	100	-	-	-
St. Louis	-	-	-	-	78	62 $\frac{1}{2}$	79	-	-	-
Toledo	-	74	-	57 $\frac{1}{2}$	-	-	-	-	-	-
Minneapolis	37 $\frac{1}{2}$	-	30 $\frac{1}{2}$	-	35 $\frac{1}{2}$	-	37 $\frac{1}{2}$	34 $\frac{1}{2}$	-	-

^{1/} This is not a tariff. Rates have been taken from tariffs on file with the Interstate Commerce Commission and are subject to change without notice.

on railroad pricing. There are five major rate territories in the United States--Official, Southern, Southwestern, Western Trunk Line, and Mountain Pacific (fig. 12).

Class rates, based on distance and density, were developed within each territory. At the same time commodity rates, based on individual needs, were established and were generally well below class rates.

The rates within a territory were fairly comparable, and the I. C. C. abolished virtually all class-rate differences between territories in 1952. Commodity-rate level differences still exist between territories, however, and this sometimes leads to freight rate advantages for certain producing areas even though they may be more distant from a particular market center.

Because rate setting is guided by a committee supported by the various railroads operating within a territory, rate adjustments are more easily

Table 4.--Selected intrastate pulpwood carload rates^{1/}
from northeastern Minnesota origins
(Rate in cents per 100 pounds)

From	To		Cloquet		Sartell		Little Falls		St. Paul	
	Miles ^{2/}	Rate	Miles ^{2/}	Rate	Miles ^{2/}	Rate	Miles ^{2/}	Rate	Miles ^{2/}	Rate
<u>D.M. & I.R. tariff</u>										
Forest Center	120	12	232	16	237	15	-	-	-	-
Sawbill	113	10.5	225	14	230	14	-	-	-	-
Isabella	90	10.5	202	14	207	14	-	-	-	-
Wales	71	10	183	14	215	14	-	-	-	-
Ely	143	11.5	-	-	-	-	260	16	-	-
Tower	123	10.5	-	-	-	-	240	15	-	-
Skibo	94	10.5	-	-	-	-	211	15	-	-
Brimson	78	10	-	-	-	-	-	-	-	-
<u>Soo Line tariff</u>										
Oklee	202	13	-	-	-	-	-	-	-	-
Trail	194	13	-	-	-	-	-	-	-	-
Gulley	190	12	-	-	-	-	-	-	-	-
Gonvick	185	12	-	-	-	-	-	-	-	-
Clearbrook	180	11	-	-	-	-	-	-	-	-
Leonard	172	11	-	-	-	-	-	-	-	-
Pinewood	164	11	-	-	-	-	-	-	-	-
Scribner	157	11	-	-	-	-	-	-	-	-
Cass Lake	134	10	-	-	-	-	-	-	-	-
Schley	123	10	-	-	-	-	-	-	-	-

^{1/} This is not a tariff. Rates have been taken from tariffs on file with the Interstate Commerce Commission and are subject to change without notice.

^{2/} Approximate short line miles.

made between points both of which fall within a territorial boundary than when two or more territories (and committees) are involved. This may, in part, explain the very competitive rates which the study area enjoys to the St. Louis and Kansas City market areas, for these are two of the larger market centers in the Western Trunk Line Territory.

Table 5.--Interstate carload rates^{1/} for pulpwood from selected Minnesota origins to several Wisconsin destinations

(Rate in cents per 100 pounds unless designated otherwise)

From	To	Eau Claire		Wisconsin Rapids		Kimberly	
		Miles ^{2/}	Rate	Miles ^{2/}	Rate	Miles ^{2/}	Rate
Ely		271	22 $\frac{1}{2}$	328	24 $\frac{1}{2}$	390	27 $\frac{1}{2}$
Tower		251	22 $\frac{1}{2}$	308	24 $\frac{1}{2}$	370	27 $\frac{1}{2}$
Forest Center		248	20	305	22 $\frac{1}{2}$	367	25 $\frac{1}{2}$
Isabella		218	20	275	22 $\frac{1}{2}$	337	25 $\frac{1}{2}$
Embarrass		239	20	296	22 $\frac{1}{2}$	358	25 $\frac{1}{2}$
Skibo		222	20	279	22 $\frac{1}{2}$	341	25 $\frac{1}{2}$
Coleraine		243	20	300	22 $\frac{1}{2}$	362	25 $\frac{1}{2}$
Two Harbors		184	19	241	21	303	23 $\frac{1}{2}$
Meadowlands		201	19	258	21	320	23 $\frac{1}{2}$
Bemidji		331	3/25 21 $\frac{1}{2}$	388	4/26 700	-	-
Scribner		339	25	396	26	-	-
Moose Lake		202	5/19 675	259	5/19 $\frac{1}{2}$ 675	-	-

^{1/} This is not a tariff. Rates have been taken from tariffs on file with the Interstate Commerce Commission and are subject to change without notice.

^{2/} Approximate short line miles.

^{3/} Applies only to Eau Claire in lots of 10 or more cars.

^{4/} Rate in cents per cord in lots of 10 or more cars.

^{5/} Rate in cents per cord on rough or machine-peeled pulpwood.

In developing rail rate comparisons, origins were considered for each product from as many regional areas as might be competitive with the study area, i. e., the Northeast, Atlantic, Carolinas, Gulf, Central, Northwest, and Lake States. These production areas might vie for consumer favor in five major population or market centers--the East Coast, Florida, Eastern Texas, California, and the Midwest (fig. 12). These population centers are not the only ones important to any producing area's marketing territory (for instance, Missouri is very important to Minnesota and the Lake States forest industries); nevertheless, these five urban-industrial centers are territories of heavy population concentrations and are expected to account for a substantial part (80 percent) of the U.S. population growth in the next 10 years. Thus, at least one or more could well be vital to any large organization's marketing plans.



Figure 12.--Outline of population-industrial centers in relation to rail-road rate association territories, and the prime line hauling territory of local railroads.

Except for the Midwest, the population complexes are located in peripheral coastal areas; therefore, they are not only a long haul from the study area, but most could be more economically served by one or more intervening or nearby production areas. Unfortunately, the Midwest population complex, which is nearest the study area, is also the most centrally located and therefore close to several producing areas. This heartland, however, is one of the largest, both in population and industry; it is rivalled only by the East Coast, and thus offers an extremely lucrative market potential. It is to this midwestern market complex and its peripheral areas that most of the rate comparisons in this study were made. Selected market cities and their rate base mileage from Duluth are:

<u>From Duluth to:</u>	<u>Miles</u>	<u>From Duluth to:</u>	<u>Miles</u>
Chicago	451	New Orleans	1314
Cleveland	751	New York	1203
Des Moines	403	Pittsburgh	879
Detroit	616	Philadelphia	1209
Indianapolis	632	St. Louis	656
Kansas City	611	Toledo	645
Louisville	742	Twin Cities	151
Milwaukee	366		

Ocean Shipping Rates

Shipping rates from Chicago, Milwaukee, New York, and Norfolk to the United Kingdom, the Continent (Antwerp, Rotterdam, Amsterdam, Hamburg, Bremen) and the Mediterranean were obtained. Because rates from Duluth are not published in a regular tariff, but are established only upon request, none were available for shipments destined to the United Kingdom or the Mediterranean. However, rates from Duluth to the Continent are tentatively set by the U.S. Great Lakes-Bordeaux-Hamburg Range Eastbound Conference at \$2.25 per ton higher than Chicago-Milwaukee rates. Specific rates may be established by vote of the Conference.

One feature of shipping rate comparisons is the variability between commodities from one port to another and between the two port areas (i.e., Great Lakes and East Coast). As might be expected, the lake ports generally have higher rates than the coast ports, and while this difference occasionally amounts to \$15 or more per ton, it seems more often to be in the range of \$10. Wider differences exist but not always to the disadvantage of the lake port. For example, a pulpboard item from New York and Norfolk to the Continental ports is quoted at \$39.00 per ton while from Milwaukee the rate is set at \$30.25. Thus in this instance a decided rate advantage is held by the lake port.

When compared with coast rates, lake port rates naturally reflect the necessity of moving freight to the coast by rail or truck, and of course the water distance from Duluth to overseas ports is from 1,000 to 1,500 miles farther than from northern East Coast ports. Undoubtedly the higher risks and extra time necessary to pass through the seaway canals and locks account in part for the higher shipping rates. Certainly it is more difficult to obtain a full load at most of the lake ports than at the larger East Coast ports; sometimes it is necessary to load at several lake ports. Duluth is at a particular disadvantage from this standpoint, since it is the only port on Lake Superior which handles general cargo freight in any appreciable amount.

Since the Seaway opened in 1959 progress in services and shipping has been significant. Seaway transit time has decreased substantially, the trip is considerably safer, port facilities are vastly improved, and loading times greatly reduced compared with conditions encountered in the early days

of the expanded Seaway. It is reported that the trend in ocean rate adjustments is favorable to the Seaway route, and this trend is expected to continue as the Seaway becomes more efficient in all aspects of cargo movement.

SUMMARY AND DISCUSSION

Transportation factors are most important in deciding on industrial locations. This study investigates the transportation resources in five northeastern Minnesota counties in relation to the potential for expansion of the forest-based industries.

Since most forest industries are raw-material oriented, the study area, with its surplus timber volumes and varied transportation facilities, offers many desirable qualities for forest industry expansion.

Except for pulpwood, imports of wood raw material into the five-county area amount to a very minor volume. They consist mainly of saw logs moving in from adjacent areas, and an intermittent flow of veneer logs from Canada. Large pulpwood imports are brought in, principally from nearby areas.

Primary forest products are exported in considerable volume. Pulpwood is the major component, with smaller quantities of veneer logs and poles also shipped out. That the study area has in the past shipped out approximately one-half of its pulpwood production is not surprising; its location adjacent to the largest paper-producing State in the country has made it a natural timbershed for Wisconsin mills, particularly for the relatively scarce long-fiber, coniferous species. However, over the last several years this export volume has shown significant yearly decrease. Rafting pulpwood from Lake Superior ports to Ashland, Wis., has held even and is important to the economy of the area, accounting for over one-quarter of the total export volumes.

Significant quantities of woodpulp and lumber come into the State from Canadian and Western U.S. sources. Some of this woodpulp probably enters the study area. Lumber is imported too, because the sizes and species of timber in northeastern Minnesota are not adequate for all types of building and industrial uses.

Transportation facilities are generally very good. Within the area, every major town except Grand Marais has rail service, including less-than-carload service. Trailer-on-flat-car ramps and side spur ramps for loading pulpwood are available in many places. The extension of the Wales branch of the D.M. & I.R. Railway into northern Lake County opened a large area to rail service, the potential of which has not yet been fully exploited.

The area also has a good primary and secondary highway system. Roads are needed to open up new timber tracts to logging, but this problem is

common to heavily forested regions. It is probably less critical and can be overcome with less expense in the five-county area than in most of the West. The deficiency is most marked in the more northern areas of St. Louis, Lake, and Cook Counties.

From a market viewpoint, the transportation picture has many positive aspects. The Midwest heartland, one of the largest of the urban-industrial complexes, is an attractive market and is within reasonable transportation distance from the study area. Seven Class I, line haul railroads serve Duluth and offer 15 freight departures a day. While it is difficult to obtain data on absolute transit times to many Midwest areas because of variability in rail schedules and the large number of possible alternatives, the general area reached in a 48-hour period from the study area includes a large segment of the Midwest market region.

Although the number of trucking concerns serving the area is not as large as in some locations, the number of destinations served by daily direct service is impressive, as are the overnight delivery schedules offered to such places as Chicago, St. Louis, Kansas City, and Omaha. If demand should increase, trucking services could readily be expanded. Highways and terrain throughout the Midwest are ideal for fast, efficient hauling, and Duluth's direct link to the national super highway system is expected to be completed within a few years. In addition, Two Harbors and the Iron Range cities will be served by two-lane, divided highways, the major portions of which are already completed or now under construction.

While all rail rates including commodity rates, are generally based on mileage, commodity rates in particular are extremely sensitive to volume, frequency of shipments, and the competitive needs of shippers. Two additional items of particular importance in rate establishment are number of lines involved in the haul, and the position of the origin and destination in relation to rate association territorial boundaries. The large number of lines serving Duluth give it many destinations reachable by one-line hauls. Much of the study area, however, is served by lines terminating in Duluth--a decided disadvantage in that the initial haul is fairly short. The local rate association territory includes Wisconsin, Illinois, Iowa, Missouri, North and South Dakota, Kansas, and Nebraska, allowing favorable rates to Chicago, St. Louis, Kansas City, Omaha, and Des Moines.

The advantage of access to worldwide, low-cost water transportation through the port of Duluth is difficult to assess fully. The importing of European hardboard and woodpulp in direct competition with local producers can be viewed as a disadvantage. However, the importing of certain grades and types of pulp more economically produced elsewhere can be an advantage for the area's paper or paperboard manufacturers. This could in some instances permit a greater amount of local pulp manufacturing by providing economical transportation rates on certain specialty pulps which may be required in the overall pulp "mix."

If the Seaway offers an advantage for importing specialty pulps required for certain blends, so do the widespread rail and truckline networks. Facility of transport to and from the area by various means can encourage local manufacture of both finished products and products to be used in further manufacturing elsewhere.

So far, however, forest-based industries of the area have not utilized the expanded Seaway to a great extent for export. But with the economic growth now taking place in western Europe and the awakening of consumer markets in undeveloped countries, this situation possibly could be reversed. Thus the area's potential for water shipment to both East Coast and world markets should not be overlooked.

Except for some limitations in the volume and variety of certain ancillary services, the general cargo handling facilities at the Duluth port are excellent, and basic banking and freight-forwarding services are available to provide initial assistance and to handle many shipping requirements. The increased efficiency of seaway and port terminal operations and the stepped-up activity in world-wide port promotion should improve the competitive position of the area in international markets. A most encouraging feature has been the increase of regularly scheduled sailings and the steady improvement in the number of general cargo ships calling at the port. Another particularly favorable factor is the lack of congestion and relative ease of moving goods into and out of the Duluth port area--movements which often create problems of storage and transfer at the larger ports.

There is a minor amount of intercoastal traffic at the present time. But there seems to be scant hope for the revival of package freight movements between Great Lakes ports and to the East Coast in the near future even though this traffic accounted for a large volume of shipments prior to World War II.

A trend of interest in pulp and paper marketing is the tendency to shift the responsibility of warehousing back to the producer, making it advantageous to have facilities close to as many market centers as possible, and stressing speed of delivery as an important requisite of the transportation resource of an area. The study area's proximity to the Midwest market, its reasonable transit times to a large Midwest area, and its versatile transportation complex should make it attractive for expanding existing or new market-oriented forest industries.

The transportation of wood raw materials from the forests to pulp or fiber mills in the form of chips is another factor that could affect the area's transportation patterns, facilities, and costs. Chips have the required flow characteristics to lend themselves to much more automated handling and storage. Thus, their use could produce radical and cost-saving departures from present practices of transporting, storing, and even harvesting logs and bolts. Remote chipping centers located in or adjacent to the logging operations themselves are now being established in certain parts of the South. There are still many questions to be answered concerning the

potential of remote chipping in the Lake States--economics, equipment design, ultimate mill demand, etc. However, the production of chips closer to the forests would seem to offer certain advantages, and further study certainly seems warranted.

In conclusion, it seems probable that with growing consumer populations creating greater product demand both nationally and in the Midwest, and with increased ingenuity in the mechanical phases of harvesting, transporting, and manufacturing wood products, northeastern Minnesota should have a good opportunity to expand activity in wood products manufacture. The area's transportation system and facilities are adequate in most respects, and deficiencies could be solved as raw material and product shipments expand.

ADDITIONAL MATERIAL AVAILABLE

Because of space limitations the following material is not included with this report, but is available upon request to the Lake States Forest Experiment Station, St. Paul Campus, University of Minnesota, St. Paul, Minn.

Description of rail lines serving the study area

List of trucking lines, and states served by interstate trucking lines

Excerpts from the Minnesota motor vehicle laws

Size and weight regulations

Registration rates for trucks

Rail rates on logs from Sawbill Landing and

Whyte to selected Wisconsin and Michigan destinations

Rail rates for writing and printing paper from various producing areas to selected cities

Rail rates for shipping wallboard and insulation board from various producing areas to selected cities

Rail rates for shipping hardboard, particleboard, and flakeboard from various producing areas to selected cities

Rail rates for shipping tissue paper and cellulose wadding from several origins to selected cities

Rail rates for shipping pulpboard and fiberboard (corrugating medium) from various producing areas to selected cities

Motor carrier commodity rates for hardboard, pulpboard, wallboard, fiberboard, and fiberboard boxes from Duluth, Minnesota, to selected destinations

Motor carrier commodity rates for wallboard,
fiberboard, pulpboard, and printing paper
from Cloquet, Minnesota, to selected
destinations

Overseas shipping rates for selected wood
products via the ports of Milwaukee-Chicago,
New York, Norfolk, and Duluth

Description of marine terminals

Public Marine Terminal

Private terminals

Comparison of port charges

SOME RECENT REPORTS ON ECONOMIC OPPORTUNITIES
IN NORTHEASTERN MINNESOTA
BY THE LAKE STATES FOREST EXPERIMENT STATION

Lake States Wood-Product Imports and Exports Via the
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